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CONTENTS

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A PLEA FOR A WIDER AND BETTER EXTENSION OF THE KNOWLEDGE OF SANITARY SCIENCE[1]

SANITARY science is young, or, at least, that much may be said of the science as we know it to-day, and consequently I presume it is scarcely reasonable to expect the public at large to be very well posted as to its latest discoveries and improvements. But so much depends upon an intelligent cooperation on the part of the masses of the people in the matter of the proper application of sanitary principles that every effort should be made to hasten the day when sound doctrine shall underlie each act of the community that is made in the interest of public health.

In view of the great width of the field which suggests itself, some kind of reduction will be necessary for our present purpose. Therefore, may I ask your attention to two items with which I have had more or less to do, viz., "water" and "air"?

A great deal has been accomplished in recent years in the matter of educating the public in the proper care of domestic water supplies; but much misunderstanding yet remains for removal, and old-time traditions are with us still.

Did you ever hear that a horse will drink no water that is of inferior quality? Such a statement has been made to me many a time and has been insisted upon as a fact. The fairy tale is pretty widely distributed, especially in country districts, and it is received as true, although it needs but a

[1] Founder's Day address, given at Lafayette College October 21, 1908.

little observation of the habits of horses to establish its fallacy. Would you, as intelligent people, who have watched horses upon occasion, care to pin your faith upon the "horse-test" as indicating the purity of your household drinking water?

When I was a boy the belief existed that the presence of many flies tended towards a healthful summer, because they were held to be the means of removal of much waste material which would otherwise decay and taint the atmosphere. We now know that flies are a source of danger in that they do not wipe their feet before crawling over our food. In this connection note the disastrous typhoid fever outbreaks in our military camps during the Spanish war. Those epidemics were occasioned by the inoculation of food by flies; flies that visited the latrines first and the kitchens afterwards.

Returning now to the water question, the time-honored dictum that a clear, bright water is of necessity a wholesome one is also still widely trusted; but it reminds me of the ruling of a Mississippi chancellor in a case with which I was once connected. His honor threw all the expert testimony out of court with the remark that the ordinary citizen is able well enough to tell whether or not a given water is fit to drink. To illustrate how far the court fell short of the truth in this instance, let me say that not long ago the clear and bright effluent from the Saratoga sewage septic tank was placed in a show window in western New York alongside of an exhibit of the local water supply, to the apparent disadvantage of the latter. Poor as the town water was, it could scarcely have been fair to compare it with filtered sewage and yet his honor from Mississippi would have judged otherwise.

The "test of experience" is constantly appealed to in support of the alleged purity of some favorite water, and the plea that "my family has used the supply for half a century" is considered an argument beyond danger of refutation, it being overlooked that a family, or even several families, can not furnish a sufficient number of persons to make the "experience test" valuable; for, be it remembered, a water known to be dangerously polluted will not transmit disease to all, nor nearly all, of those who drink it. As a matter of fact, when one considers the question from a numerical standpoint, basing his investigation upon the population of a large community, the conclusion is forced upon him that the per capita danger from polluted water is really small. Thus, in a city of 100,000 inhabitants, which I have in mind, the high typhoid death rate, manifestly caused by bad water, was about 90 per year; which means that over 99,000 of the people did not have the disease at all.

Now how about this great majority of the citizens that escaped. They would not be likely to testify as to the dangers of the water supply. As you see, the risk is small and it takes a large community to make data about it valuable, but relatively small though it be, it nevertheless is a good investment for a city to avoid it, because human life has a money value and the town which cuts its typhoid rate in half by the erection of a filter plant receives very quick return for the funds expended.

Doubtless one reason why so many people deny the existence of danger lurking in some specific drinking water is because of the non-dramatic character of the attack.

Let us suppose that a city has a yearly typhoid death rate of 75, which means that 750 people per 100,000 inhabitants have the disease each year and that 75 of them die. The impression upon the community is not really felt except by those whose homes are invaded and the remainder of the population would be likely to resort to

the old story "we have used the water for years without harm, etc." What do you think would happen in such a city if some trolley road were so badly managed as to kill 75 people every year and injure 675 others? Do you fancy it would be long before there would be mob demonstration against such a road? Or again, suppose a foreign warship should drop shells into the streets of such a town, killing from one to two people weekly and wounding nine times as many; would the people who had been hit be likely to listen with patience to such of their neighbors as claimed that because they had not been struck they doubted if there were any war vessel in the river after all?

Let us glance for a moment at the question of atmospheric air.

We all breathe, but we have been doing it so long and for the most part so easily, that a great many of us forget that we do it at all. We also eat, but the occasions for eating produce an impression upon us. Moreover, we are to a large degree particular as to the quality of the things we eat. Fancy trying to induce your employees to accept improper and tainted food. Such an effort would very probably and properly breed a riot, and yet those same people will sleep in badly overcrowded rooms and will likely complain of drafts if the windows be open. Without food they could live a week and more, while with no air they could not survive five minutes, yet one hears but rarely any comment upon the quality of that necessity of life which is so vastly more important than food.

It doubtless would be a surprising statement to preach very widely, but the cold fact remains that bad air is responsible for more deaths than alcohol. Much as we deplore the evil effects of strong drink, its victims, both innocent and guilty, are few compared with those of the "great white plague." Are you aware that practically ten per cent. of all those who died in the state of New York during the past year died of consumption, a disease which is closely connected with polluted air? Please remember those figures, one in every ten.

This has been termed "the age of hygiene" and I think the expression a good one. Much hygienic advancement has been accomplished, but a great deal more remains to be secured. Perhaps as noteworthy an instance of improvement as can be quoted is the smaller amount of spitting one sees in the street cars. That is a most encouraging fact, but why should not ventilation of the cars be insisted upon also. Given a crowded car upon a misty evening in January when the workers are returning home with garments soiled and wet, if the ventilators be closed, as they commonly are, the air within is utterly unfit for breathing. If the two halves of the car roof were hinged upon a sort of ridge pole and occasionally thrown open for a short time, much improvement in the air would result and that too without complaint, because the public will accept a great inrush of cold air for a moment when they would object to a small stream of continuous flow.

As already said, much has been done, but the question is often asked, is there any substantial benefit to show for it? Are we really better off than our forefathers because we possess these so-called improvements?

There is but one answer to such a question and that is to ask the inquirer to consult the recorded death rates and to note that the total rate for London has fallen 75 per cent. in less than 300 years; that consumption in the English army has lessened since an increased air space has been provided in barracks; that small-pox is now practically unknown in the German army, because of compulsory vaccination; and that typhoid fever has been reduced in

some municipalities as much as 70 per cent. by the introduction of filtered water.

It being a fact beyond doubt that good sanitary knowledge is a real asset of a community, the question is in order, how are we to secure a better general understanding of sanitary principles? How are the people, particularly the poorer people, to be educated along such lines?

Of all members of a community, the physicians are the ones towards whom we most quickly look for instruction in matters sanitary. Their profession primarily, of course, deals with the combating of maladies already in evidence, but they have also an undoubted duty to perform in protecting men from disease as well as in curing them of it. That being granted, it is pertinent to inquire if the medical schools provide such instruction as will place their graduates in a position to properly meet their double responsibility. So far as I can discover, such a question must too often be answered in the negative. It is expected of a physician that he should speak ex-cathedra upon topics dealing with the protection of health, but, aside from some noteworthy exceptions, the average doctor has, through no fault of his own, been unprovided with very strong foundations in sanitary science.

Let us now look at another group of men with responsibilities.

Whenever human beings are gathered together in organized bodies, as during military service, those in control of them have the serious task of safeguarding their health and it goes without saying that such persons should be equal to performing the duties of their office. Of the amount of knowledge of a sanitary kind possessed by officers of the regular army I can not speak, although my belief is that those of the medical staff, at any rate, are well-posted men. All of us must surely allow no small measure of praise to the officers of the Japanese army in view of the excellent results secured by them during the Russian war.

What can be said, however, of the expert knowledge of our officers of militia? Simply nothing. As a class, they have no proper understanding of the sanitary needs of large groups of men and yet they have been and may be again suddenly called upon to command bodies of troops in the field. Of course the line officers have those of the medical staff to lean upon, but even so, an ignorant line commander can not be educated while on the march and he can readily place his men amid such unsanitary surroundings as will produce evils exceeding the power of his medical adviser to rectify. We all know the general method followed for the selection of militia officers and are aware that popularity, coupled with a knowledge of tactics, constitutes the total requirement for election. An examination has to be passed before a commission is secured, but in that examination the questions touching upon the sanitary care of troops are few indeed. Imagine a detachment of state soldiers suddenly deprived of meat food. Is it likely that many of their line officers would be capable of suggesting a vegetable high in nitrogen to replace it?

I contend that those who are responsible for the safety of enlisted men should be as well qualified to protect them from an invasion of disease as from the bullets of the enemy. For it has been well said that if we could eliminate disease from army life, then war would become an international pastime somewhat less dangerous per capita per hour for those engaged than college football. And further, not only should the officers be posted in matters sanitary, but the men themselves should receive some sort of instruction calculated to increase their safety, efficiency and comfort.

As akin to what we have said, our thoughts now turn to another group of responsible leaders who are placed in control of bodies of very ignorant laborers. I refer to our civil engineers. Such men have a double responsibility, for it is their duty not only to protect the health of their employees, but they are also bound to guard against the very real danger of contamination reaching some neighboring town's water supply by reason of the laborers camping upon the watershed. Many an epidemic has been traced to that source of pollution.

The curricula of our engineering schools are not destitute of instruction in sanitary science, but the time devoted to it is distinctly small.

Let us change the point of view for a moment and ask how much of this kind of information is possessed by our graduate trained nurses. With what confidence could you depend upon their knowledge of the dangers lurking in water or milk and the best way to guard against them? Are they as posted as they should be upon the longevity of the more common disease germs and do they know why corrosive sublimate is not uniformly a good disinfectant for tuberculosis sputum? The answer is evident, but the blame is not with them. It lies with those who mapped out their line of training.

As a final group for our consideration let us turn towards the children in our schools and the students in some of our non-technical colleges. Are they receiving the amount and particularly the kind of sanitary instruction fitted to their future needs as intelligent citizens? Please note that I dwell upon the quality as well as upon the quantity of teaching they receive. If they be taught to clean the outside only of the cup and the platter; if they be so misled as to confound a deodorizer with a disinfectant; if they be induced to believe that straining off that which is apparent to the eye will render a polluted water safely potable, then I claim that their little knowledge is a very dangerous thing and distinctly worse than none at all.

Of all the people in the nation, the ones from whom we expect the greatest returns for our efforts in sanitary instruction are those who are sufficiently young to approach the subject with no previous prejudices. One of England's greatest surgeons, now a few years dead, was a strong opponent of the germ theory of pus formation. He expressed himself as willing to dress his patients' wounds with such bacteria if he could but get enough of them for the purpose. Men so set in their ways do not easily respond to any form of conversion. It is with those who are now young that we must lodge our hope and it is among them that we should push our sanitary propaganda, but let us advance it evenly and by first-class instructors.

A word as to what I mean by such terms.

An immense amount of effort has been expended in the cause of temperance and excellent results have been secured, but let me ask, has any similar crusade been pushed with equal vigor against the spread of other forms of intoxication; that, for instance, produced by the toxin of bacillus typhosus or the still more serious bacillus of tuberculosis? Have you any idea of the relative numbers of victims claimed by alcohol, typhoid fever and consumption each year? The effects of alcoholism are more dramatic and more disgusting and therefore more quickly command our attention, but as to the question of annual fatality and suffering produced, it is the least evil of the three.

	Deaths in State of New York, 1907
From alcoholism	1,023
From typhoid fever	1,688
From consumption	14,406

When a man drinks alcohol the object lesson for the onlooker comes speedily and it is easy for the reformer to enlist his sympathy in a temperance movement. But when one breathes in foul air loaded with the bacilli of tuberculosis no immediate results are observed and the opportunity does not present itself of closely connecting the inoculation with the subsequent development of the disease.

Please do not misunderstand me. I am very far indeed from wishing to in any way lessen the temperance movement, but I can not help feeling that the plan of campaign of that movement might very properly be studied, and possibly applied, for the arrest of the other two disorders mentioned above.[1]

Education is what is needed, not only for the purpose of coping with alcoholism, but with a view of attacking the other ills as well. You are aware, doubtless, that the temperance reformers have advanced their cause until it is a strong factor in matters political, and that they have secured the passage of laws ordering that public instruction be given as to the dangers incident to the use of alcohol. Have you ever heard of so considerable a movement being inaugurated to check the ravages of consumption or typhoid fever? Earnest efforts are now afoot to do something in that line and a good deal has been really accomplished, but those engaged in the work by no means exhibit the broad front and army-like march of the temperance organization. The people as a whole are not sufficiently educated as yet to appreciate the necessity of decided action and their sympathy with the needed reform is not awakened.

May I digress a moment and venture a word as to the wave of interest in the care and cure of consumption as we now see it in northern New York?

In the city from which I come we are plentifully supplied with committees of devoted men and women who contribute of their own means and ask pecuniary aid from others, giving meanwhile much of their time and energy for the purpose of relieving the wants and lessening the sufferings of their consumptive neighbors. The cause is such a noble one and the movement is so single-hearted that I feel badly indeed to predict its failure. Yet I believe that it must fail and for this reason. Successful handling of the consumptive poor must be the duty of public officers backed by the public purse. Funds raised by subscription and applied by voluntary workers can not grapple with the situation, because of the practically chronic character of the disease. If the community were invaded by cholera, yellow fever or the black death, and if the dead were being removed in furniture vans, as they were at Messina in 1887, then the "contribution-volunteer system" would work to perfection, because the people will always labor enthusiastically and make any amount of sacrifice to resist an attack which is quick, sharp and decisive; but if the service required be continuous, the same ten or twenty years hence as it is to-day, then the interest begins to weaken after a time, the treasury becomes empty and the movement slackens. There is just one place whence the funds for the care of the consumptive poor should come, and that is the tax budget. Is not this a plea for the education, not only of the officials who make up the budget, but also of those who vote them into office?

[1] My reason for selecting alcoholism for comparison is because of the excellent organization of those who oppose it, an organization worthy of being copied for more general use. It should be noted, moreover, that I have treated alcoholism as a disease and have touched upon its death rate only. It is scarcely necessary to add that the moral side, which is of such great importance in this affliction, does not enter the figures as given.

And finally a word as to the second point I mentioned some lines back.

Our young people should get their sanitary instruction from thoroughly competent sources, or they would do better to have none at all, because false teaching is dangerous. Books are often much out of date and it is always better to rely upon the freshly accumulated experience of those who are in touch with the active problems of the day. Even though the hours must be few during which the student is in contact with some one who is master of his specialty, yet the benefit derived greatly surpasses that obtained during a longer period of second-hand teaching.

There is no branch of instruction that lends itself more readily to what has been termed the "alumni lecture course" than does that of sanitary science.

Subsequent to the lecture a thorough quiz could be readily carried on by a person detailed for that purpose, but it should be based upon the points developed by the lecture and the latter should be given by a man who is thoroughly competent and actively engaged in his profession.

W. P. MASON

THE FUTURE OF AGRICULTURAL CHEMISTRY[1]

IT may seem uncalled for at a time when agricultural chemistry has been undergoing such rapid evolution and expansion in the United States, to enter upon a discussion of its future. It is, nevertheless, true that conditions are now developing in this and other countries and have reached their culmination in Germany, which make a discussion of this subject not only desirable and timely, but practically imperative.

There is no time when it is so important to bring out correct views as to the nature of the development of an educational movement as when it is feeling some new and enormous impetus. When building progresses slowly and by stages much time is afforded for changes of plan as the work progresses, but where the progress is rapid and one stage follows another in quick succession it is of vastly greater importance that the plans shall have been fully perfected at the outset. The latter situation is certainly now before us so far as concerns agriculture and the sciences closely related thereto. The agitation for the teaching of nature study in its application to agriculture in the primary schools, the introduction of elementary agricultural instruction into the high school, the rapidly increasing demand for collegiate agricultural instruction and the imperative and almost unmet demand for university training as a proper preparation of teachers for the agricultural college and of investigators for the work of the experiment stations, have created a new and unique situation which should be met not only immediately, but most wisely. The present difficulty is not encountered solely at a single stage, but is more or less acute, as concerns the school, college and university. It is therefore of vital importance to recognize the first and most pressing need in order that by meeting it the whole situation may be relieved most quickly and satisfactorily.

The teacher of nature study in the elementary school would naturally be trained in the high school or normal school, but in this line of instruction these schools are lacking; hence there is now coming a demand upon the agricultural college to supply such teachers. The necessity under these conditions for sound instruction in the agricultural college and for men with thorough university training to teach in them, is greater than ever before.

[1] Address of the chairman of the Section of Agricultural and Food Chemistry, delivered at the Baltimore meeting of the association.